# Do We Have to Be Concerned about Online Teaching Amid COVID-19?: A Lesson Learned from Meta-Analysis of Previous Researches

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## Abstract

*This study aims to explore the effectiveness of online teaching by meta-analysing previous researches as to address concern about the effectiveness of online teaching relative to the face-to-face teaching and to provide suggestions on how to improve the effectiveness of online teaching delivered by teachers amid coronavirus disease 2019 (also referred to as COVID-19). Nine experimental studies that met the inclusion criteria and that compared online teaching and face-to-face teaching with the students' achievement outcome were included to be examined. Sample sizes, means and standard deviations for the selected studies were extracted to calculate effect sizes. Effect sizes were calculated and combined through the random effect meta-analysis using RevMan5.3. The results show that the online teaching and the face-to-face teaching were equally effective. The subgroup analysis indicated that the online teaching with differed length of the experiment time had different effectiveness measured by the effect size. The results also suggest that time does matter for the online teaching. Specifically, the online teaching that spends less than one month is less effective than the face-to-face teaching. However, when the instructors spend more time on online teaching, their students' achievement is comparable to the achievement of students from face-to-face instruction. The implications for the delivery of the online teaching amid COVID-19 were also discussed.*

***Keywords***: *effectiveness, online teaching, meta-analysis, COVID-19*

## Introduction

The pandemic of the coronavirus disease 2019 (COVID-19) does stimulate health-related concerns nationally and globally. Many countries got devastating effects of the disease in terms of the number of infected cases and deaths. Immediate measures such as mask wearing and physical distancing have been strictly required for their citizen to present and control the spread of the disease. The pandemic of COVID-19 not only dramatically affects global and national economy, but also education. Schools and universities have been closed since the outbreak of COVID-19 was alarmed by the World Health Organisation (WHO). Online instruction as an alternative strategy to deliver education to students during the requirement of social distancing has been adopted by teachers at various levels of education to provide education to students while schools and universities are closed. For example, several universities in the United States announced that forms of online teaching would be implemented and regular grading policy has to be changed from letter grades to pass or fail.

Changes of the mentioned pedagogical delivery platform by switching from the traditional teaching method, face-to-face method, to online teaching bring about questions from teachers, parents and educators as well as those questions that need to be addressed by empirical evidences to guide effective decisions on the adoption and implementation of the online instruction amid COVID-19. The first question is the concern about whether or not such online teaching is effective compared to the regular method of teaching which is the face-to-face instruction. If is not effective, it could bring negative consequences to student learning. The second question is related to the educational inequality issue. Such question is the concern about whether or not the online teaching could expedite educational inequality especially for students from low income families where parents could not support their children financially. For instance, because of the financial constraint, they were unable to provide devices, computers and tools for online instruction. This would prevent students from accessing quality education and would widen achievement gap between students from poor and rich families.

This study attempts to address the second concern. This kind of concern or inquiry can be fulfilled by conducting research comparing the online and face-to-face teaching by using experimental research in order to reveal their relative effectiveness. Alternatively, as some experimental studies on online teaching have been conducted (Ni, 2013; Arias, Swinton & Anderson, 2018), meta-analysis, a statistical method for combing previous studies to provide the understanding of the relative effectiveness of treatments (Hunter, Schmidt & Jackson, 1982) is a choice of research design that could be conducted to provide the answer to the question on the effectiveness of online teaching. It is considered a method of evidence-based practices that is capable of providing best practices for practitioners.

## Objective

This study aimed to investigate the effectiveness of online teaching by meta-analysing previous researches on online teaching so as to address the concern about the effectiveness of online teaching delivered by teachers amid COVID-19 and to provide suggestions to enhance the effectiveness of the online teaching.

## Literature Review

### Online learning during the current pandemic of COVID-19

Online instruction is one of the innovative pedagogical approaches that utilises technological innovations to provide students with the access to course contents through internet. Student learning can take place anywhere and anytime depending on where and when they need. Online learning is thus defined as learning that takes place partially or entirely over the internet. To adopt online learning, some course management software such as Blackboard and Moodle are used by online instructors to deliver online content to students and encourage student interaction and participation. During the COVID-19 pandemic, educational technology that makes online instruction feasible has been seen as a significant tool for providing education to students when face-to-face instruction was not employed because of school closure. However, the access to internet varies across countries is limited in some developing countries and therefore a lack of access to internet is considered to be the biggest challenges for learning during the pandemic of COVID-19. Even though internet connectivity is considered the biggest barrier, online instruction is viewed by educators as a top choice in response to the COVID-19 pandemic (eLearning Africa, 2020).

### Effectiveness of online teaching

There are rising uses of online instruction in various disciplines because of its cost-effectiveness by proving education and training across geographical and time constraints (Bartley & Golek, 2004). This study reveals that online pedagogy has been used in K-12 school, university, firms, training and intervention. Its uses are believed to develop learning outcomes, affective domain characteristics and to reduce health problems. However, researches on the effectiveness of online teaching reveal inconsistent findings. Soffer and Nachmias (2007) reported the superior of online teaching to face-to-face instruction in both course engagement and satisfaction. Gayed et al. (2019) compared the effectiveness of face-to-face and online training in terms of the improvement of managers' confidence to support the mental health of employees. It was found that even though both methods of training improved managers' confidence, a greater change was manifested with face-to-face training than for online.

Farrer, Gulliver, Katruss, Fassnacht and Kyrios (2019) examined a new multi-component online intervention developed to improve the mental health of university students. They found that the online intervention slightly reduced social anxiety and slightly improved academic self-efficacy and the intervention was not effective in reducing psychological symptoms such as anxiety, depression and psychological distress. Rusali, Manaf, Sharbar and Mazaki (2018)compared online and face-to-face interventions in reducing weight and found that the face-to-face programme offered in workplace was more effective than the online program in improving health outcomes.

In summary, during the pandemic of COVID-19, online learning is a mandated teaching method to be used for protecting students. However, it is not stated if this teaching method would achieve satisfactory results. Due to the fact that findings of previous studies are inconsistent and that inconsistency may increase fears and devalue online instruction that might cause negative impacts on students, parents and education systems; it is necessary to determine if the online teaching is effective and how it can be improved in order to make various groups of users more confident to use online learning during the COVID-19 pandemic. Therefore, synthesizing was done on previous experimental studies that compared face-to-face teaching and online teaching. Meta-analysis, a quantitative approach for combining resultsof previous studies to draw conclusions about the body of research, can provide answers to this question. The findings would provide a lesson learned for

practitioners and help lead into the inquiry on how to design the online teaching during the pandemic of COVID-19.

## Research Method

The population of this study used the previous research studies on the effectiveness of the online instruction. This research reviewed previous studies on the online instruction to obtain the sample for the meta-analysis. The search keywords included “online instruction”, “face-to-face instruction”, “comparison” and “effectiveness”. The inclusion criteria included (i) the research used experimental study with the control group design, (ii) the control group was the face-to-face instruction, (iii) the included studies provided full text and reported enough results to calculate effect sizes, and (iv) the independent and dependent variables were teaching method and student achievement, respectively. The search strategy was used to select studies from online database including ProQuest, Science Direct, PsycInfo, Education Research Complete, Single Search and Academic Search Complete. The search strategy obtained nine studies from a variety of research fields including nursing, medicine, English as a second language, business management, economics and psychology that meet the inclusion criteria. There were 807 participants involved in the nine studies.

In meta-analysis, effectiveness or effect of treatment on a desired outcome is measured by the effect size which is computed as the standardised difference in the outcome between the treatment group and the control group (Hunter, Schmidt & Jackson, 1982). This research used a meta-analysis to examine if effect sizes from individual previous studies varied and if the effect sizes were heterogeneous, further analysis called subgroup analysis was conducted to explore what studies’ contextual variables could explain the observed heterogeneity in the effect sizes.

Given the collected sample sizes, means, and standard deviations of the treatment and the control groups, effect sizes for individual studies were calculated using Hodges’s formula (1981) implemented in RevMan 5.3 which was expressed as the standardised mean difference between the treatment and control groups. Hedges’s g formula adjusts bias for Cohen’s effect size (1988) by correcting sample size to adjust overestimates of effect sizes estimated by Cohen’s d. In this study, random effect meta-analysis was conducted through the computer program called RevMan 5.3. Larger effect size indicates that the treatment is more effective than the traditional method used in the control group.

## Findings

The findings from the meta-analysis that was carried out are presented in Figure 1. The combined effect size was -.08 which is statistically different from zero (p=.074). The individual effect sizes from the nine studies were heterogeneous (I-square = 90%), suggesting that the effect sizes across studies were largely different. Subgroup analysis was conducted to explain why the individual effect sizes were different. The subgroup analysis separated the nine studies into two groups with different periods of time for experiment. The first group had six studies with one month or less than one month of experiment, while the second group comprised three studies with more than one month of experiment. The result indicated that the two groups had different effect sizes that were statistically significant at .05 (chi-square = 4.20, p=.04). Obviously, the first group had the negative effect size of -.45 which was statistically and significantly different from zero at .05 (p=.00), while the second group had the positive effect size of .70 which was not statistically and significantly different from zero at .05 (p=.70).

**Figure 1**

*Forrest plot*

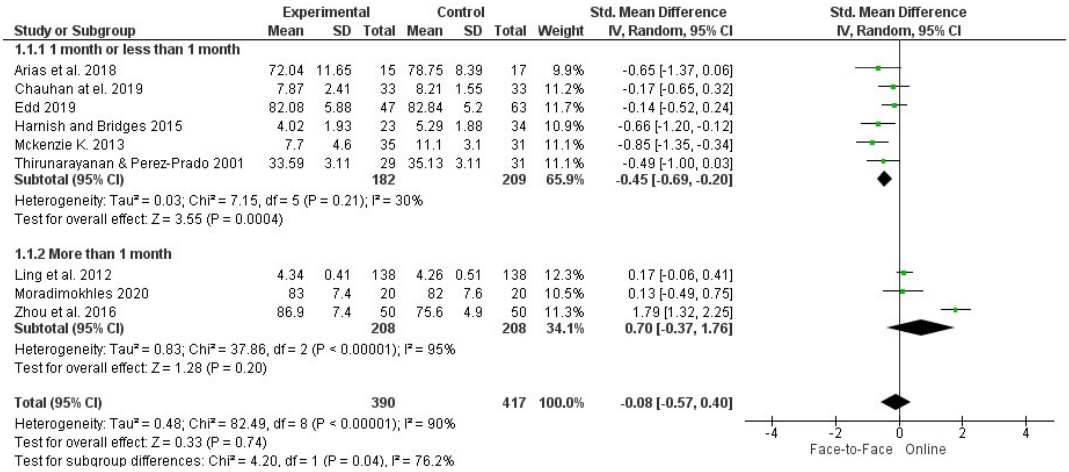
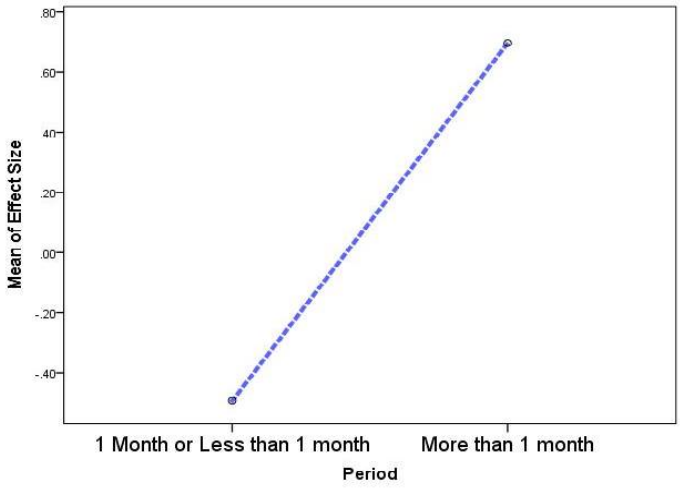



Figure 2 shows the comparison of effect sizes between studies with different periods of time for experiment. It indicates that the effect size for the previous studies that spent more than one month to carry our experiments had the combined effect size greater than the studies that spent one month or less than one month.

**Figure 2**

*The comparison of effect sizes between studies with different periods of time for experiment*




## Discussion

During the COVID-19 pandemic, online teaching has been viewed by many people as a less effective method of teaching compared to the face-to-face teaching. When the pandemic became serious and teachers had to switch from face-to-face teaching to online teaching as to protect students from COVID-19, exponential rise of concerns among various groups of stakeholders were onserved. The main concern is the potential negative impact that online teaching could have on student learning. Although face-to-face instruction and online instruction were found in this study to be comparable in terms of effectiveness, their

effectiveness largely depends on the control of teachers.The finding of this study provides the evidence to implement best practices and has significant implication for teachers, school principals, administrators, educators and policymakers on the preparation of teachers for teaching online courses during COVID-19 pandemic. It is believed by scholars and educators that online teaching lacks models upon which to structure its processes (Bartley & Golek, 2004) and some common misconceptions in the application of online teaching are manifested.

The most significant misconception is that some instructors merely adapted their classroom models into the online medium (Shaw, 2001). One lesson learned from the meta-analysis of past researches in this study is that it suggests to develop online teaching the aforementioned salient misconception should be fixed, that is, instructors who are not well trained to create online lessons should not be advised to deliver their online lessons by merely loading contents to be taught to internet or online platforms. This is due to the unfamiliarity with educational technology or equipment used to construct online courses which could not allow them to reach effectiveness. Hence, teachers are expected to be trained in order to develop skills in online teaching and teacher training should be provided by giving them sufficient time and space to practice and learn until they develop skills to produce effective online courses. Spending sufficient time for teacher professional development in online teaching is necessary. The provision of teacher training for at least one month is considered enough for teachers to develop skills required to produce effective online teaching. Schools and colleges are obligated to provide training to teachers to develop their knowledge and skills such as technological competency, social skills, language teaching skills, skills to teach creativity and personal teaching style in an online medium (Hampel & Stickler, 2005) before they can produce and deliver effective online instruction.

In order to achieve this goal, effective models of online teaching training can be selected and used. Wang, Chen and Levy (2010) suggested the cyclic approach of action, reflection and improvement to train teachers in a synchronous cyber face-to-face classroom. Meanwhile Paesani (2020) mentioned that teacher development activities should be goal directed, collaborative, experiential, scaffolded and sustainable. Goal-directed activity intentionally and deliberately move teachers towards more sound instructional practice. Collaborative activity can provide feedback to teachers from mentors and peers. Experiential activity provides practice-based tasks such that teacher apply knowledge and skills with guided feedback. Scaffolding can provide successive levels of support that help teachers function independently over time. Meanwhile sustainable activity emphasises coherent and long-term activities.

## Conclusion

This study investigates the effectiveness of the online teaching by using meta-analysis to analyse previous studies by addressing the concern raised by teachers, parents and educators about the effectiveness of online teaching adopted by teachers to provide education to students amid COVID-19. The major finding indicated that the online teaching was as effective as the face-to-face teaching but it depends on the period of time teachers spend on their online courses. The finding suggests that when instructors spend more time on online teaching, their students' achievement will be comparable to the achievement of students from the face-to-face instruction. Therefore parents, teachers, students and educators should not be worried about the effectiveness of the online teaching. However, the issue of teacher training is a cause of great concern. This study highlights that the preparation for teachers to use online tools and platforms are needed about at least one month before they launch their online courses.

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